The HOLIVAR Open Science Meeting

London, UK; 12-15 June 2006

After just over five years, six workshops, three summer schools and one conference, the HOLIVAR program came to an end with a final Open Science Meeting (OSM) at University College London from 12-15 June 2006.

HOLIVAR was designed to bring climate change scientists together to promote interaction and collaboration between climate modelers and paleoclimatologists. At the OSM, both communities combined to present a state-of-the-art synthesis of Holocene climate variability research via both keynote lectures and poster sessions.

In opening the meeting, **John Birks** (Bergen, Norway and UCL, UK) reviewed the history of Holocene research, tracing its roots back to a competition by the Danish Academy of Sciences in Denmark in the 1830s to explain the occurrence of pine stumps in Danish peat bogs (Figure 1). The prize was won by Japetus Steenstrup (Figure 2) who argued in 1841 that the plant and animal remains preserved in bogs might reflect past changes in moisture and temperature.

The second keynote by **Paul Valdes** (Bristol, UK) reviewed the somewhat shorter history of Holocene climate modeling from COHMAP through to the present day, focusing on PMIP1 and 2 simulations and the continuing evolution towards complete Earth system models—an evolution driven by comparisons between model simulations and the paleorecord.

In the third keynote, **Frank Oldfield** (Liverpool, UK) urged future Earth system research to include the additional complexity introduced by human-climate-environment interactions through time. He pointed to the need for a greater understanding of how human societies in the past were affected by or adapted to climate change.

Following these three introductory presentations, the program was organized around four themes:

Figure 1: Fossil pine stumps from the Cooran Lane, Galloway, South-west Scotland (photo courtesy of John and Hilary Birks)

Theme 1—Millennial time scales

Eystein Jansen (Bergen, Norway) argued that the Holocene "climate optimum" was a regional phenomenon driven by the northern hemisphere summer insolation maximum and amplified by sea-ice feedback in the polar regions. He also presented evidence that sea surface temperatures were higher in the Medieval Warm Period and lower in the Little Ice Age but that these were out of phase with SSTs in the Caribbean.

Michel Crucifix (Hadley Centre, UK) described the use of 2.5D and 3D models, explaining the importance of, but difficulty in implementing, transient simulations in the Holocene. He stressed the need for a hierarchy of different modeling approaches, including modeling paleorecords themselves.

Theme 2—Decadal to centennial time scales

Jürg Beer (Zurich, Switzerland) described the forcings that were important on a decadal to centennial time-scale, focusing especially on solar forcing. He argued that there was clear evidence for solar forcing from the Holocene record but great difficulty in quantifying it.

Bas van Geel (Amsterdam, the Netherlands) was concerned with the potential drivers of decadal to century scale climate variability. He pointed out that the role of solar forcing was poorly understood but could have caused past changes in moisture balance sufficient to affect human societies. He noted that its role may be underestimated in the present global warming debate.

Theme 3—Climate variability in the last 2000 years

Mike Mann (Pennsylvania, USA) noted that that the basic hockey-stick nature of Northern Hemisphere mean temperature trends for the last 1000 years was supported by many independent proxy- and model-based analyses covering the same period. However, he also emphasized the importance of moving beyond the hockey stick. He explained how the use of data-model comparisons, including natural (especially volcanic) forcing could explain many features of pre-19th century climate variability, including the El Niño-like nature of the Little Ice Age, and the regional pattern of change more generally associated with El Niño and the NAO.

Hugues Goosse (Louvain-la-Neuve, Belgium) presented model results that showed how temperature differences between regions

Figure 2: Japetus Steenstrup (1813-1897), a pioneer of Holocene research. Steensrup won the Danish Academy of Sciences prize for "solving the problem" of how pine trees once grew on Danish bogs.

could be due to spatial responses to particular forcings and/or to internal variability. He also argued that data assimilation of paleo-proxy data in models could improve our understanding of past changes.

Theme 4—Rapid hydrological change

Dirk Verschuren (Gent, Belgium), using proxy evidence from Europe and Africa, argued that a number of periods of cooler and wetter conditions, inferred from peatland and lake-level changes in Europe, corresponded to periods of reduced solar activity. In Africa, especially in Eastern Equatorial Africa, there was some evidence for a similar inverse relationship between solar activity and moisture.

Martin Claussen (Hamburg, Germany) argued that rapid climate change, capable of affecting early civilizations, occurred in North Africa during the Holocene, and that the climate at 5500 BP was especially unstable. He maintained that Earth system models are now capable of simulating rapid swings between arid and wet phases in the past but may not yet be able to predict future rapid transitions reliably.

In the final keynote, **Ray Bradley** (Amherst, USA) presented an array of evidence to demonstrate the relevance of understanding past climate to provide insights for the future. He stressed the importance of understanding the cause and consequences of rapid changes, especially abrupt, unprecedented and persistent climate anomalies (AUPs), for which there were many examples, mainly droughts, in the paleo-record.

The meeting was attended by 250 people from 30 countries, including 83 students, 18 of whom received support. There were 150 posters covering the four themes, and book prizes were awarded to the five best student posters: Rixt de Jong (Lund, Sweden, Jun Inoue (Osaka, Japan), Bettina Stefanini (Dublin, Ireland), Auriel Per oiu (Romania), and Peter De Geest (Brussels, Belgium).

Further information

The HOLIVAR2006 website (www.holivar2006.org) will remain active for at least 12 months and is being updated with poster pdfs. It will also provide video-streaming of the keynote presentations. The official journal for papers is Climate of the Past, and the conference book (Global warming and natural variability: a Holocene perspective, Eds. Battarbee, R.W. and Binney, H.) will be published by Blackwell in 2007.

Rick Battarbee, Heather Binney and Mike Hughes
Environmental Change Research Centre, University College London, UK;
r.battarbee@ucl.ac.uk

PAGES/CLIVAR workshop on past millennia climate variability – synthesis and outlook

Wengen, Switzerland; 7-10 June 2006

This workshop followed the spirit of the reorganized PAGES/CLIVAR working group (see PAGES News, 2005/1). It was organized by the PAGES/CLIVAR Intersection Working Group (P. Jones, M. Mann, H. Wanner, K. Briffa) in concert with the PAGES office in Bern. Twenty-four participants (Fig. 1), representing various different climate data and modeling sub-disciplines were invited to discuss the state of the art and future needs in the study of late Holocene climate variability. Two days were devoted to short presentations and extended discussions on hot topics and issues, covering the areas of proxy data, climate reconstructions and paleoclimate modeling. The issue of how to deal with uncertainties in assessing climate variability over the past one-to-two millennia was discussed in detail. Questions posed and addressed included: What do current uncertainty estimates take into account? How relevant are current uncertainties for the general findings regarding past climate variability in the past? The following primary conclusions were reached:

- Late 20th century warming is likely anomalous in the context of the past 1000 years at hemispheric scales. There is evidence for periods of cooling and warming that occur on all timescales and on all spatial scales. For pre-instrumental periods, it is vital to consider both the spatial extent and duration of regional climate anomalies.
- Comparisons of model-predicted and reconstructed climate variations over the past several centuries are generally favorable, taking into account the currently available data and their uncertainties.
- Natural radiative forcing appears to play an important role on the relevant timescales. Solar forcing may account for variability on decadal through millennial timescales. Individual volcanic eruptions impact climate generally for only a few years but longer-term episodes of closely spaced large eruptions (e.g. as in the early 19th century) can lead to multidecadal-scale effects.
- Usefully constraining estimates of global climate sensitivity from paleoclimate data will require a better knowledge of past radiative forcing and the amplitude of internal, as well as forced, natural variability.

The discussions emphasized the importance of distinguishing past hemispheric or global-scale variability from regional variations. For example, it was shown that the widely used term "Medieval Warm Period" is simply not an appropriate description of Medieval climate in many regions of the world. Coral data from Kim Cobb, for example, suggest instead a "Medieval Cool Period" for the tropical Pacific. Such considerations reinforce the principle that a better regional documentation of past climate is necessary to better understand the past. The group that was assembled took note of the importance of focusing not simply on the often emphasized hemispheric mean temperature variations of past centuries, but also on spatial